



Standard Specification for Seamless and Welded Carbon Steel Water-Well Pipe¹

This standard is issued under the fixed designation A 589; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers four specific types of plain end or threaded and coupled carbon steel pipe for use in water wells.

1.2 Each type of water well pipe shall conform to the following methods of manufacture and grade as specified on the purchase order:

1.2.1 *Type I, Drive Pipe*—Seamless or electric-resistance-welded, Grades A and B.

1.2.2 *Type II, Water-Well Reamed and Drifted Pipe*—Seamless or electric-resistance-welded, Grades A and B, or furnace-butt welded.

1.2.3 *Type III, Driven Well Pipe*—Seamless or electric-resistance-welded, Grades A and B, or furnace-butt welded.

1.2.4 *Type IV, Water-Well Casing Pipe*—Seamless or electric-resistance-welded, Grades A and B, or furnace-butt welded.

1.3 The values stated in inch-pound units are to be regarded as the standard.

NOTE 1—The dimensionless designator NPS (nominal pipe size) has been substituted in this standard for such traditional terms as “nominal diameter,” “size,” and “nominal size.”

2. Referenced Documents

2.1 ASTM Standards:

A 53/A 53M Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless²

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products³

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products³

A 865 Specification for Threaded Couplings, Steel, Black or Zinc Coated (Galvanized), Welded or Seamless, for Use in Steel Pipe Joints²

2.2 API Standard:

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.09 on Carbon Steel Tubular Products.

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² Annual Book of ASTM Standards, Vol 01.01.

³ Annual Book of ASTM Standards, Vol 01.03.

5L Specification for Line Pipe⁴

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *defect*—an imperfection of sufficient size or magnitude to be cause for rejection.

3.1.2 *imperfection*—any discontinuity or irregularity found in the pipe.

4. Ordering Information

4.1 Orders for material to this specification should include the following, as required to describe the desired material adequately:

4.1.1 Quantity (feet or number of lengths),

4.1.2 Name of material or type number (see 1.2),

4.1.3 Method of manufacture (furnace-butt welded, seamless, or electric-resistance-welded),

4.1.4 Grade (A or B for seamless or electric-resistance welded),

4.1.5 Finish (black or galvanized),

4.1.6 Dimensions (NPS or outside diameter and wall thickness, or both, for Types I, II, and III. Outside diameter and wall thickness for Type IV),

4.1.7 End finish (plain end or threaded and coupled),

4.1.8 Coupling class for Type III (standard pipe, line pipe, or reamed and drifted pipe coupling),

4.1.9 Coupling make-up (hand tight or power tight),

4.1.10 Length (required random range length or special lengths),

4.1.11 Specification designation, and

4.1.12 Special requirements.

5. Materials and Manufacture

5.1 The steel for both seamless and welded pipe shall be made by one of the following processes: open-hearth, electric-furnace, or basic-oxygen.

5.2 Steel may be cast in ingots or may be strand cast. When steels of different grades are sequentially strand cast, identification of the resultant transition material is required. The

⁴ Available from American Petroleum Institute, 1220 L. St., NW, Washington, DC 20005.



producer shall remove the transition material by any established procedure that positively separates the grades.

6. Chemical Composition

6.1 The steel shall conform to the following requirements as to chemical composition:

| | |
|--------------------|-------|
| Phosphorus, max, % | 0.050 |
| Sulfur, max, % | 0.060 |

7. Heat Analysis

7.1 An analysis of each heat of steel shall be made by the manufacturer to determine the percentage of the elements specified in 6.1. When requested by the purchaser, the chemical composition thus determined shall be reported to the purchaser, and shall conform to the requirements specified in 6.1.

8. Product Analysis

8.1 An analysis may be made by the purchaser on two lengths of pipe from each lot of 500 lengths, or fraction thereof.

Samples for chemical analysis and the methods of analysis shall conform to the requirements of Test Methods, Practices, and Terminology A 751. The chemical composition thus determined shall conform to the requirements specified in 6.1.

8.2 If the analysis of either pipe does not conform to the requirements of 6.1, analysis shall be made on additional lengths of pipe of double the original number from the same lot, each of which shall conform to the requirements specified.

9. Tensile Requirements

9.1 The material shall conform to the requirements as to tensile properties specified in Table 1. See Table 2 for minimum elongation values.

9.2 The test specimen taken across the weld shall show a tensile strength not less than the minimum tensile strength specified for the grade of pipe ordered. This test is not required for pipe under 8 in. in outside diameter.

TABLE 1 Tensile Requirements

| | Butt Welded | Grade A | Grade B |
|----------------------------------|--------------|--------------|--------------|
| Tensile strength, min, psi (MPa) | 48 000 (330) | 48 000 (330) | 60 000 (415) |
| Yield strength, min, psi (MPa) | 30 000 (205) | 30 000 (205) | 35 000 (240) |
| Elongation in 2 in. | A,B | A,B | A,B |

^A The minimum elongation in 2 in. (50.8 mm) shall be that determined by the following equation:

$$e = 625 \ 000 A^{0.2} / U^{0.9}$$

where:

e = minimum elongation in 2 in. (50.8 mm) in percent rounded to the nearest 0.5 %.

A = cross-sectional area of the tension test specimen in square inches, based on specified outside diameter or nominal specimen width and specified wall thickness rounded to the nearest 0.01 in.² If the area thus calculated is greater than 0.75 in.², then the value 0.75 shall be used.

U = specified tensile strength, psi.

^B See Table 2 for minimum elongation values for various size tension specimens and grades.

TABLE 2 Elongation Values^A

| Area, <i>A</i> in. ^B | Tension Test Specimen | | | Elongation in 2 in. min % | | |
|---------------------------------|--|-------------------|--------------------|---------------------------------|--------|--------|
| | Specified Wall Thickness, in. ^C | | | Specified Tensile Strength, psi | | |
| | 3/4-in. Specimen | 1-in. Specimen | 1 1/2-in. Specimen | 45 000 | 48 000 | 60 000 |
| 0.75 and greater | 0.944 and greater | 0.746 and greater | 0.497 and greater | 38.5 | 36.0 | 29.5 |
| 0.74 | 0.980–0.993 | 0.735–0.745 | 0.490–0.496 | 38.0 | 36.0 | 29.5 |
| 0.73 | 0.967–0.979 | 0.726–0.734 | 0.484–0.489 | 38.0 | 36.0 | 29.5 |
| 0.72 | 0.954–0.966 | 0.715–0.725 | 0.477–0.483 | 38.0 | 36.0 | 29.5 |
| 0.71 | 0.941–0.953 | 0.706–0.714 | 0.471–0.476 | 38.0 | 35.5 | 29.0 |
| 0.70 | 0.927–0.940 | 0.695–0.705 | 0.464–0.470 | 38.0 | 35.5 | 29.0 |
| 0.69 | 0.914–0.926 | 0.686–0.694 | 0.457–0.463 | 37.5 | 35.5 | 29.0 |
| 0.68 | 0.900–0.913 | 0.675–0.685 | 0.450–0.456 | 37.5 | 35.5 | 29.0 |
| 0.67 | 0.887–0.899 | 0.666–0.674 | 0.444–0.449 | 37.5 | 35.5 | 29.0 |
| 0.66 | 0.874–0.886 | 0.655–0.665 | 0.437–0.443 | 37.5 | 35.0 | 29.0 |
| 0.65 | 0.861–0.873 | 0.646–0.654 | 0.431–0.436 | 37.0 | 35.0 | 28.5 |
| 0.64 | 0.847–0.860 | 0.635–0.645 | 0.424–0.430 | 37.0 | 35.0 | 28.5 |
| 0.63 | 0.834–0.846 | 0.626–0.634 | 0.417–0.423 | 37.0 | 35.0 | 28.5 |
| 0.62 | 0.820–0.833 | 0.615–0.625 | 0.410–0.416 | 37.0 | 35.0 | 28.5 |
| 0.61 | 0.807–0.819 | 0.606–0.614 | 0.404–0.409 | 36.5 | 34.5 | 28.5 |
| 0.60 | 0.794–0.806 | 0.595–0.605 | 0.397–0.403 | 36.5 | 34.5 | 28.5 |
| 0.59 | 0.781–0.793 | 0.586–0.594 | 0.391–0.396 | 36.5 | 34.5 | 28.0 |
| 0.58 | 0.767–0.780 | 0.575–0.585 | 0.384–0.390 | 36.5 | 34.5 | 28.0 |
| 0.57 | 0.754–0.766 | 0.566–0.574 | 0.377–0.383 | 36.0 | 34.0 | 28.0 |

TABLE 2 *Continued*

| Area, A in. ^B | Tension Test Specimen | | | Elongation in 2 in. min % | | |
|--------------------------|--|-------------------|--------------------|---------------------------------|--------|--------|
| | Specified Wall Thickness, in. ^C | | | Specified Tensile Strength, psi | | |
| | 3/4-in. Specimen | 1-in. Specimen | 1 1/2-in. Specimen | 45 000 | 48 000 | 60 000 |
| 0.56 | 0.740–0.753 | 0.555–0.565 | 0.370–0.376 | 36.0 | 34.0 | 28.0 |
| 0.55 | 0.727–0.739 | 0.546–0.554 | 0.364–0.369 | 36.0 | 34.0 | 28.0 |
| 0.54 | 0.714–0.726 | 0.535–0.545 | 0.357–0.363 | 36.0 | 34.0 | 27.5 |
| 0.53 | 0.701–0.713 | 0.526–0.534 | 0.351–0.356 | 35.5 | 33.5 | 27.5 |
| 0.52 | 0.687–0.700 | 0.515–0.525 | 0.344–0.350 | 35.5 | 33.5 | 27.5 |
| 0.51 | 0.674–0.686 | 0.506–0.514 | 0.337–0.343 | 35.5 | 33.5 | 27.5 |
| 0.50 | 0.660–0.673 | 0.495–0.505 | 0.330–0.336 | 35.5 | 33.5 | 27.0 |
| 0.49 | 0.647–0.659 | 0.486–0.494 | 0.324–0.329 | 35.0 | 33.0 | 27.0 |
| 0.48 | 0.634–0.646 | 0.475–0.485 | 0.317–0.323 | 35.0 | 33.0 | 27.0 |
| 0.47 | 0.621–0.633 | 0.466–0.474 | 0.311–0.316 | 35.0 | 33.0 | 27.0 |
| 0.46 | 0.607–0.620 | 0.455–0.465 | 0.304–0.310 | 34.5 | 33.0 | 27.0 |
| 0.45 | 0.594–0.606 | 0.446–0.454 | 0.297–0.303 | 34.5 | 32.5 | 26.5 |
| 0.44 | 0.580–0.593 | 0.435–0.445 | 0.290–0.296 | 34.5 | 32.5 | 26.5 |
| 0.43 | 0.567–0.579 | 0.426–0.434 | 0.284–0.289 | 34.5 | 32.5 | 26.5 |
| 0.42 | 0.554–0.566 | 0.415–0.425 | 0.277–0.283 | 34.0 | 32.0 | 26.5 |
| 0.41 | 0.541–0.553 | 0.406–0.414 | 0.271–0.276 | 34.0 | 32.0 | 26.0 |
| 0.40 | 0.527–0.540 | 0.395–0.405 | 0.264–0.270 | 34.0 | 32.0 | 26.0 |
| 0.39 | 0.514–0.526 | 0.386–0.394 | 0.257–0.263 | 33.5 | 31.5 | 26.0 |
| 0.38 | 0.500–0.513 | 0.375–0.385 | 0.250–0.256 | 33.5 | 31.5 | 26.0 |
| 0.37 | 0.487–0.499 | 0.366–0.374 | 0.244–0.249 | 33.0 | 31.5 | 25.5 |
| 0.36 | 0.474–0.486 | 0.355–0.365 | 0.237–0.243 | 33.0 | 31.0 | 25.5 |
| 0.35 | 0.461–0.473 | 0.346–0.354 | 0.231–0.236 | 33.0 | 31.0 | 25.5 |
| 0.34 | 0.477–0.460 | 0.335–0.345 | 0.224–0.230 | 32.5 | 31.0 | 25.0 |
| 0.33 | 0.434–0.446 | 0.326–0.334 | 0.217–0.233 | 32.5 | 30.5 | 25.0 |
| 0.32 | 0.420–0.433 | 0.315–0.325 | 0.210–0.216 | 32.5 | 30.5 | 25.0 |
| 0.31 | 0.407–0.419 | 0.306–0.314 | 0.204–0.209 | 32.0 | 30.5 | 25.0 |
| 0.30 | 0.394–0.406 | 0.295–0.305 | 0.197–0.203 | 32.0 | 30.0 | 24.5 |
| 0.29 | 0.381–0.393 | 0.286–0.294 | 0.191–0.196 | 31.5 | 30.0 | 24.5 |
| 0.28 | 0.367–0.380 | 0.275–0.285 | 0.184–0.190 | 31.5 | 29.5 | 24.5 |
| 0.27 | 0.354–0.366 | 0.266–0.274 | 0.177–0.183 | 31.0 | 29.5 | 24.0 |
| 0.26 | 0.340–0.353 | 0.255–0.265 | 0.170–0.176 | 31.0 | 29.0 | 24.0 |
| 0.25 | 0.327–0.339 | 0.246–0.254 | 0.164–0.169 | 30.5 | 29.0 | 23.5 |
| 0.24 | 0.314–0.326 | 0.235–0.245 | 0.157–0.163 | 30.5 | 29.0 | 23.5 |
| 0.23 | 0.301–0.313 | 0.226–0.234 | 0.151–0.156 | 30.0 | 28.5 | 23.5 |
| 0.22 | 0.287–0.300 | 0.251–0.225 | 0.144–0.150 | 30.0 | 28.5 | 23.0 |
| 0.21 | 0.274–0.286 | 0.206–0.214 | 0.137–0.143 | 29.5 | 28.0 | 23.0 |
| 0.20 | 0.260–0.273 | 0.195–0.205 | 0.130–0.136 | 29.5 | 27.5 | 22.5 |
| 0.19 | 0.247–0.269 | 0.186–0.194 | 0.124–0.129 | 29.0 | 27.5 | 22.5 |
| 0.18 | 0.234–0.246 | 0.175–0.185 | 0.117–0.123 | 29.0 | 27.0 | 22.0 |
| 0.17 | 0.221–0.233 | 0.166–0.174 | 0.111–0.116 | 28.5 | 27.0 | 22.0 |
| 0.16 | 0.207–0.220 | 0.155–0.165 | 0.104–0.110 | 28.0 | 26.5 | 21.5 |
| 0.15 | 0.194–0.206 | 0.146–0.154 | 0.097–0.103 | 27.5 | 26.0 | 21.5 |
| 0.14 | 0.180–0.193 | 0.135–0.145 | 0.091–0.096 | 27.5 | 26.0 | 21.0 |
| 0.13 | 0.167–0.179 | 0.126–0.134 | 0.084–0.090 | 27.0 | 25.5 | 21.0 |
| 0.12 | 0.154–0.166 | 0.115–0.125 | 0.077–0.083 | 26.5 | 25.0 | 20.5 |
| 0.11 | 0.141–0.153 | 0.106–0.114 | 0.071–0.076 | 26.0 | 24.5 | 20.0 |
| 0.10 | 0.127–0.140 | 0.095–0.105 | 0.064–0.070 | 25.5 | 24.0 | 19.5 |
| 0.09 | 0.114–0.126 | 0.086–0.094 | 0.057–0.063 | 25.0 | 23.5 | 19.5 |
| 0.08 | 0.100–0.113 | 0.075–0.085 | 0.050–0.056 | 24.5 | 23.0 | 19.0 |
| 0.07 | 0.087–0.099 | 0.066–0.074 | 0.044–0.049 | 24.0 | 22.5 | 18.5 |
| 0.06 | 0.074–0.086 | 0.055–0.065 | 0.037–0.043 | 23.0 | 22.0 | 18.0 |
| 0.05 | 0.061–0.073 | 0.046–0.054 | 0.031–0.036 | 22.5 | 21.0 | 17.0 |
| 0.04 | 0.047–0.060 | 0.035–0.045 | 0.024–0.030 | 21.5 | 20.0 | 16.5 |
| 0.03 | 0.034–0.046 | 0.026–0.034 | 0.017–0.023 | 20.0 | 19.0 | 15.5 |
| 0.02 | 0.020–0.033 | 0.015–0.025 | 0.010–0.016 | 18.5 | 17.5 | 14.5 |
| 0.01 and less | 0.019 and less | 0.014 and less | 0.009 and less | 16.0 | 15.0 | 12.5 |

^A Tabulated in this table are the minimum elongation values calculated by the equation given in Table 1.

^B 1 in.² = 645.16 mm².

^C 1 in. = 25.4 mm.

10. Dimensions, Weights, and Permissible Variations

10.1 The dimensions and weights of all types of pipe included in this specification are listed in Tables 3-10:



TABLE 3 Dimensions, Weights, and Test Pressures for Drive Pipe

| NPS Design- ator | Weight per Foot, lb/ft ^A | | Wall Thick- ness, in. ^B | Diameters, in. ^B | | No. of Threads per Inch | Couplings | | Test Pressures, psi ^C | | |
|------------------------|--|-----------------------------|---|-----------------------------|--------|-------------------------------|-----------------------------|--|--|---------|---------|
| | Nominal Threads and Coup- lings | Calculated Plain Ends | | Outside | Inside | | Length, in. ^B | Outside Diameter, in. ^B | Calculated Weight, lb ^D | Grade A | Grade B |
| 6 | 19.45 | 18.97 | 0.280 | 6.625 | 6.065 | 8 | 5 1/8 | 7.290 | 13.35 | 1200 | 1300 |
| 8 | 25.55 | 24.70 | 0.277 | 8.625 | 8.071 | 8 | 6 1/8 | 9.625 | 26.89 | 1200 | 1300 |
| 8 | 29.35 | 28.55 | 0.322 | 8.625 | 7.981 | 8 | 6 1/8 | 9.625 | 26.89 | 1300 | 1600 |
| 8 | 32.40 | 31.27 | 0.354 | 8.625 | 7.917 | 8 | 6 1/8 | 9.625 | 26.89 | 1300 | 1600 |
| 10 | 32.75 | 31.20 | 0.279 | 10.750 | 10.192 | 8 | 6 5/8 | 11.750 | 36.05 | 940 | 1100 |
| 10 | 35.75 | 34.24 | 0.307 | 10.750 | 10.136 | 8 | 6 5/8 | 11.750 | 36.05 | 1000 | 1200 |
| 10 | 41.85 | 40.48 | 0.365 | 10.750 | 10.020 | 8 | 6 5/8 | 11.750 | 36.05 | 1200 | 1400 |
| 12 | 45.45 | 43.77 | 0.330 | 12.750 | 12.090 | 8 | 6 5/8 | 14.000 | 52.72 | 950 | 1100 |
| 12 | 51.15 | 49.56 | 0.375 | 12.750 | 12.000 | 8 | 6 5/8 | 14.000 | 52.72 | 1100 | 1200 |
| 14 D | 57.00 | 54.57 | 0.375 | 14.000 | 13.250 | 8 | 7 1/8 | 15.000 | 50.22 | 950 | 1100 |
| 16 D | 65.30 | 62.58 | 0.375 | 16.000 | 15.250 | 8 | 7 1/8 | 17.000 | 57.17 | 850 | 1000 |

^A 1 lb/ft = 1.488 kg/m.^B 1 in. = 25.4 mm.^C 1 psi = 6.895 MPa.^D 1 lb = 0.454 kg.

TABLE 4 Basic Threading Data for Drive Pipe

NOTE—All dimensions are in inches (1 in. = 25.4 mm).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | | |
|------------------------|-------------------------------|----------------------------|---|-----------------------------|--|---|-----------------------|-----------------------------|-----------------------|-----------------------|--|-----------------------------|--|--|--|
| Pipe | | | | Threads ^A | | | | | | | | | Coupling | | |
| NPS Design- ator | Out- side Diam- eter | Num- ber per Inch | Length, End of Pipe to Hand-tight Plane | Effec- tive Length | Total Length, End of Pipe to Vanish Point | Pitch Diameter at Hand- tight Plane | Outside Di- ameter | Length | Diameter of Recess | Depth of Recess | Length, Face of Coupling to Hand- tight Plane | Width of Bearing Face | Hand- tight Standoff, Threads | | |
| | D ^B | | L ₁ ^B | L ₂ ^B | L ₄ ^B | E ₁ ^B | W ^B | N _L ^B | Q ^B | q ^B | M ^B | b ^B | A ^B | | |
| 6 | 6.625 | 8 | 1.093 | 1.973 | 2.438 | 6.51375 | 7.390 | 5 1/8 | 6.719 | 3/8 | 0.595 | 1/4 | 6 | | |
| 8 | 8.625 | 8 | 1.593 | 2.473 | 2.938 | 8.51375 | 9.625 | 6 1/8 | 8.719 | 3/8 | 0.595 | 1/4 | 6 | | |
| 10 | 10.750 | 8 | 1.843 | 2.723 | 3.188 | 10.63875 | 11.750 | 6 5/8 | 10.844 | 3/8 | 0.595 | 3/8 | 6 | | |
| 12 | 12.750 | 8 | 1.843 | 2.723 | 3.188 | 12.63875 | 14.000 | 6 5/8 | 12.844 | 3/8 | 0.595 | 3/8 | 6 | | |
| 14 D | 14.000 | 8 | 2.093 | 2.973 | 3.438 | 13.88875 | 15.000 | 7 1/8 | 14.094 | 3/8 | 0.595 | 3/8 | 6 | | |
| 16 D | 16.000 | 8 | 2.093 | 2.973 | 3.438 | 15.88875 | 17.000 | 7 1/8 | 16.094 | 3/8 | 0.595 | 3/8 | 6 | | |

^A Taper of threads is 3/16 in./ft on diameter for all sizes.^B See Fig. 1.

Type

Tables

| | |
|-----------------------------|-------|
| I, Drive Pipe | 3, 4 |
| II, Reamed and Drifted Pipe | 5, 6 |
| III, Driven Well Pipe | 7, 8 |
| IV, Water-Well Casing Pipe | 9, 10 |

10.2 Permissible Variations in Weight and Dimensions:

10.2.1 **Weight**—The weight of all types of pipe included in this specification shall vary not more than $\pm 5\%$ from that prescribed. The weight tolerance for pipe NPS 4 and under may be determined from the weight of the customary lifts of pipe as produced for shipment, divided by the number of feet of pipe in the lift. For pipe over NPS 4, where individual lengths may be weighed, the weight is applicable to the individual length.

10.2.2 **Outside Diameter**—For pipe NPS 1 1/2 and under, the outside diameters shall vary not more than 1/64 in. (0.4 mm) from the outside diameter specified. For pipe NPS 2 and over the outside diameter shall vary not more than $\pm 1\%$ from the size specified.

10.2.3 **Inside Diameter**—For Type II pipe, the inside diameter at any point, shall permit passage of a drift pin having a length and diameter as indicated in Table 5 and Table 11.

10.2.4 **Thickness**—The minimum wall thickness shall be not more than 12.5 % under the nominal wall thickness specified.

10.3 Lengths:

10.3.1 Unless otherwise specified on the purchase order, pipe lengths shall be in accordance with the following regular practice:

10.3.1.1 Types I, II, and IV pipe may be furnished in single random lengths of 16 to 22 ft (4.9 to 6.7 m).

10.3.1.2 Type III pipe may be furnished in a random range from 3 to 6 ft (0.9 to 1.8 m) or 6 to 10 ft (1.8 to 3.0 m) as specified.

10.3.2 Random lengths other than indicated in 10.3.1 and cut lengths, shall be subject to negotiation and shall be indicated on the purchase order.



TABLE 5 Dimensions, Weights, and Test Pressures for Water-Well Reamed and Drifted Pipe

| NPS Designator | Weight per Foot, lb/ft ^A | | Wall Thickness, in. ^B | Diameters, in. ^B | | No. of Threads per Inch | Couplings | | | Test Pressures, psi ^C | | |
|-------------------|---|-----------------------------|--|-----------------------------|--------------------------|-------------------------------|-----------------------------|---|---|----------------------------------|------------|------------|
| | Nominal Threads and Coup- lings | Calculated Plain Ends | | Out- side | In- side ^D | | Length, in. ^B | Outside Diam- eter, in. ^B | Calcu- lated Weight, lb ^E | Butt Weld- ed | Grade A | Grade B |
| 1 | 1.70 | 1.68 | 0.133 | 1.315 | 1.049 | 11½ | 2¾ | 1.576 | 0.52 | 700 | 700 | 700 |
| 1¼ | 2.30 | 2.27 | 0.140 | 1.660 | 1.380 | 11½ | 2¾ | 1.900 | 0.60 | 1000 | 1000 | 1100 |
| 1½ | 2.75 | 2.72 | 0.145 | 1.900 | 1.610 | 11½ | 2¾ | 2.200 | 0.84 | 1000 | 1000 | 1100 |
| 2 | 3.75 | 3.65 | 0.154 | 2.375 | 2.067 | 11½ | 3¾ | 2.750 | 1.58 | 1000 | 2300 | 2500 |
| 2 | 4.00 | 3.94 | 0.167 | 2.375 | 2.041 | 11½ | 3¾ | 2.750 | 1.58 | 1000 | 2500 | 2500 |
| 2½ | 5.90 | 5.79 | 0.203 | 2.875 | 2.469 | 8 | 3½ | 3.250 | 2.32 | 1000 | 2500 | 2500 |
| 3 | 7.70 | 7.58 | 0.216 | 3.500 | 3.068 | 8 | 4½ | 4.000 | 3.80 | 1000 | 2200 | 2500 |
| 3½ | 9.25 | 9.11 | 0.226 | 4.000 | 3.548 | 8 | 4¾ | 4.625 | 5.53 | 1200 | 2000 | 2400 |
| 4 | 11.00 | 10.79 | 0.237 | 4.500 | 4.026 | 8 | 4¾ | 5.200 | 7.14 | 1200 | 1900 | 2200 |
| 5 | 15.00 | 14.62 | 0.258 | 5.563 | 5.047 | 8 | 4½ | 6.296 | 9.57 | 1200 | 1700 | 1900 |
| 6 | 19.45 | 18.97 | 0.280 | 6.625 | 6.065 | 8 | 4½ | 7.390 | 12.32 | ... | 1500 | 1800 |
| 8 | 29.35 | 28.55 | 0.322 | 8.625 | 7.981 | 8 | 5½ | 9.625 | 22.35 | ... | 1300 | 1600 |
| 10 | 41.85 | 40.48 | 0.365 | 10.750 | 10.020 | 8 | 5½ | 11.750 | 30.61 | ... | 1200 | 1400 |
| 12 | 51.15 | 49.56 | 0.375 | 12.750 | 12.000 | 8 | 5½ | 14.000 | 47.96 | ... | 1100 | 1200 |

^A 1 lb/ft = 1.488 kg/m.^B 1 in. = 25.4 mm.^C 1 psi = 6.895 MPa.^D Drift pin dimensions (see Table 11)^E 1 lb = 0.454 kg.

TABLE 6 Basic Threading Data for Water-Well Reamed and Drifted Pipe

NOTE—All dimensions are in inches (1 in. = 25.4 mm).

| NPS Design- inator | Outside Di- ameter | Number per Inch | Length, End of Pipe to Hand-tight Plane | Effective Length | Total Length, End of Pipe to Vanish Point | Pitch Diameter at Hand- tight Plane | Outside Diameter | Length | Diameter of Recess | Depth of Recess | Coupling | | |
|--------------------------|-----------------------|--------------------|---|---------------------|--|---|---------------------|--------|--------------------------|-----------------------|----------------------|-----------------------------|-----------------------------|
| | | | | | | | | | | | Threads ^A | | |
| | | | | | | | | | | | D ^B | L ₁ ^B | L ₂ ^B |
| 1 | 1.315 | 11½ | 0.4811 | 0.6828 | 0.9845 | 1.24369 | 1.576 | 2¾ | 1.378 | 0.1875 | 0.5034 | 1/16 | 0 |
| 1¼ | 1.660 | 11½ | 0.5051 | 0.7068 | 1.0085 | 1.58869 | 1.900 | 2¾ | 1.723 | 0.1875 | 0.5034 | 1/16 | 0 |
| 1½ | 1.900 | 11½ | 0.5218 | 0.7235 | 1.0252 | 1.82869 | 2.200 | 2¾ | 1.963 | 0.1875 | 0.5034 | 3/32 | 0 |
| 2 | 2.375 | 11½ | 0.7012 | 0.9884 | 1.2901 | 2.29835 | 2.750 | 3¾ | 2.469 | 0.1875 | 0.5889 | 3/32 | 0 |
| 2½ | 2.875 | 8 | 0.9342 | 1.1375 | 1.5712 | 2.77792 | 3.250 | 3½ | 2.969 | 0.1875 | 0.6370 | 3/32 | 0 |
| 3 | 3.500 | 8 | 0.9967 | 1.2000 | 1.6337 | 3.40292 | 4.000 | 4½ | 3.594 | 0.1875 | 0.6370 | 1/8 | 0 |
| 3½ | 4.000 | 8 | 1.0467 | 1.2500 | 1.6837 | 3.90292 | 4.625 | 4¾ | 4.094 | 0.1875 | 0.6370 | 3/16 | 0 |
| 4 | 4.500 | 8 | 1.0967 | 1.3000 | 1.7337 | 4.40292 | 5.200 | 4½ | 4.594 | 0.1875 | 0.6370 | 1/4 | 0 |
| 5 | 5.563 | 8 | 1.2030 | 1.4063 | 1.8400 | 5.46592 | 6.296 | 4½ | 5.657 | 0.1875 | 0.6370 | 1/4 | 0 |
| 6 | 6.625 | 8 | 1.3092 | 1.5125 | 1.9462 | 6.52792 | 7.390 | 4½ | 6.719 | 0.1875 | 0.6370 | 1/4 | 0 |
| 8 | 8.625 | 8 | 1.5092 | 1.7125 | 2.1462 | 8.52792 | 9.625 | 4½ | 8.719 | 0.1875 | 0.6370 | 1/4 | 0 |
| 10 | 10.750 | 8 | 1.7217 | 1.9250 | 2.3587 | 10.65292 | 11.750 | 5½ | 10.844 | 0.1875 | 0.6370 | 3/8 | 0 |
| 12 | 12.750 | 8 | 1.9217 | 2.1250 | 2.5587 | 12.65292 | 14.000 | 5½ | 12.844 | 0.1875 | 0.6370 | 3/8 | 0 |

^A Taper of threads is 3/4 in./ft on diameter for all sizes.^B See Fig. 2

11. Ends

11.1 When ordered with plain ends, the pipe shall be furnished to the following practice unless otherwise specified.

11.1.1 *NPS 1½ and smaller*—Unless otherwise specified on the purchase order, end finish shall be at the option of the manufacturer.

11.1.2 *NPS 2 and larger*—Unless otherwise specified on the purchase order, end finish shall be plain end beveled to an

angle of 30° + 5° and –0°, as measured from a line drawn perpendicular to the axis of the pipe, with a root face of 1/16 in. ± 1/32 in.

11.2 When ordered threaded and coupled, each length of water well pipe shall be furnished with threaded ends and provided with a suitable coupling applied handling-tight. If couplings are required to be made up power tight, this shall be indicated on the purchase order.

TABLE 7 Dimensions,^A Weights,^A and Test Pressures for Driven Well Pipe

| NPS Designator | Weight per Foot, lb/ft ^B | | Wall Thickness, in. ^C | Diameters, in. ^C | | No. of Threads per Inch | Test Pressures, psi ^D | | Grade A | Grade B |
|----------------|-------------------------------------|-----------------------|----------------------------------|-----------------------------|---------------------|-------------------------|------------------------------------|-------------|---------|---------|
| | Nominal Threads and Couplings | Calculated Plain Ends | | Outside | Inside ^A | | Calculated Weight, lb ^E | Butt Welded | | |
| 1 | 1.68 | 1.68 | 0.133 | 1.315 | 1.049 | 11½ | 0.40 | 700 | 700 | 700 |
| 1½ | 2.28 | 2.27 | 0.140 | 1.660 | 1.380 | 11½ | 0.48 | 1000 | 1000 | 1100 |
| 2 | 2.73 | 2.72 | 0.145 | 1.900 | 1.610 | 11½ | 0.67 | 1000 | 1000 | 1100 |
| | 3.68 | 3.65 | 0.154 | 2.375 | 2.067 | 11½ | 1.05 | 1000 | 2300 | 2500 |

^A Nominal T & C weights shown are based on the standard pipe coupling. For pipe weights with reamed and drifted coupling applied, see Table 5 of this specification. For weights with the line pipe coupling applied refer to API Standard 5L.

^B 1 lb/ft = 1.488 kg/m.

^C 1 in. = 25.4 mm.

^D 1 psi = 6.895 MPa.

^E 1 lb = 0.454 kg.

TABLE 8 Basic Threading Data^A for Driven Well Pipe

NOTE—All dimensions are inches (1 in. = 25.4 mm).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | |
|----------------|------------------|-----------------|---|-----------------------------|---|-----------------------------------|---|---|-----------------------------|--|
| Pipe | | | | Threads | | | | | Joint Make-up | |
| NPS Designator | Outside Diameter | Number per Inch | Length, End of Pipe to Hand-tight Plane | Effective Length | Total Length, End of Pipe to Vanish Point | Pitch Diameter at Handtight Plane | Length, Face of Coupling to Handtight Plane | Width of Bearing Face | Handtight Standoff, Threads | |
| | D ^B | | L ₁ ^B | L ₂ ^B | L ₄ ^B | E ₁ ^B | M ^B | b ^B | A ^B | |
| 1 | 1.315 | 11½ | 0.400 | 0.6828 | 0.9845 | 1.23863 | 0.1304 | approximately 1/3 thickness of coupling | 5.22 | |
| 1½ | 1.660 | 11½ | 0.420 | 0.7068 | 1.0085 | 1.58338 | 0.1304 | | 5.27 | |
| 2 | 1.900 | 11½ | 0.420 | 0.7235 | 1.0252 | 1.82234 | 0.1304 | | 5.46 | |
| | 2.375 | 11½ | 0.436 | 0.7565 | 1.0582 | 2.29627 | 0.1304 | | 5.66 | |

^A Based on standard-weight pipe with standard coupling. For basic threading data of reamed and drifted coupling see Table 6 of this specification. For line pipe coupling refer to API Standard 5L.

^B See Fig. 3.

TABLE 9 Dimensions, Weights, and Test Pressures for Water-Well Casing

| Size, Outside Diameter, in. ^A | Weight per Foot, lb/ft ^B | | Wall Thickness, in. ^A | Diameters, in. ^A | | No. of Threads per Inch | Couplings | | Test Pressures, psi ^C |
|--|-------------------------------------|------------|----------------------------------|-----------------------------|--------|-------------------------|--------------------------|------------------------------------|----------------------------------|
| | Threads and Couplings | Plain Ends | | Outside | Inside | | Length, in. ^A | Outside Diameter, in. ^A | |
| 3.500 | 4.60 | 4.51 | 0.125 | 3.500 | 3.250 | 14 | 3½ | 4.000 | 2.86 |
| 4.000 | 5.65 | 5.53 | 0.134 | 4.000 | 3.732 | 14 | 3½ | 4.500 | 3.24 |
| 4.500 | 6.75 | 6.61 | 0.142 | 4.500 | 4.216 | 14 | 3½ | 5.000 | 4.26 |
| 5.500 | 9.00 | 8.79 | 0.154 | 5.500 | 5.192 | 14 | 4½ | 6.050 | 6.38 |
| 6.000 | 10.50 | 10.22 | 0.164 | 6.000 | 5.672 | 14 | 4½ | 6.625 | 7.84 |
| 6.625 | 13.00 | 12.72 | 0.185 | 6.625 | 6.255 | 11½ | 4½ | 7.390 | 11.88 |
| 8.625 | 17.80 | 16.90 | 0.188 | 8.625 | 8.249 | 11½ | 5¼ | 9.625 | 22.92 |

^A 1 in. = 25.4 mm.

^B 1 lb/ft = 1.488 kg/m.

^C 1 psi = 6.895 MPa.

^D 1 lb = 0.454 kg.

11.3 The basic thread dimensions for each type of water well pipe are shown in Table 4, Table 6, Table 8, and Table 10. An illustration of the joint of each type of water well pipe is shown in Figs. 1-4.

11.4 For Type III pipe, the threads on the pipe ends are interchangeable with either the standard pipe coupling, the reamed and drifted pipe coupling, or the API line pipe coupling. Orders for this class material shall indicate the coupling class desired.

11.4.1 Standard pipe couplings shall be manufactured in accordance with Specification A 865.

11.4.2 Line pipe couplings shall be manufactured in accordance with API 5L Specification for Line Pipe.

11.5 The threads on the pipe ends not protected by a coupling shall be suitably protected against damage in normal handling and transit conditions.

11.6 The length of the pipe shall be measured to the outer face of the coupling.



TABLE 10 Basic Threading Data for Water-Well Casing

NOTE—All dimensions are in inches (1 in. = 25.4 mm).

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|-------------------------|------------------|---|-------------------|---|------------------------------------|-------------------|--------|--------------------|-----------------|--|-----------------------|----------------------|
| Threads ^A | | | | | | | | | | | | |
| Size, Out-side Diameter | Num-ber per Inch | Length, End of Pipe to Hand-tight Plane | Effec-tive Length | Total Length, End of Pipe to Vanish Point | Pitch Diameter at Hand-tight Plane | Outside Di-ameter | Length | Diameter of Recess | Depth of Recess | Length, Face of Coupling to Hand-tight Plane | Width of Bearing Face | Hand-tight Standoff, |
| 3½ | 14 | 0.5241 | 1.0455 | 1.3071 | 3.4296 | 4.000 | 3⅛ | 3⅓ ₃₂ | ⅓ | 0.426 | 5/32 | 5 |
| 4 | 14 | 0.5741 | 1.0955 | 1.3571 | 3.9296 | 4.500 | 3⅛ | 4⅓ ₃₂ | ⅓ | 0.426 | 5/32 | 5 |
| 4½ | 14 | 0.6241 | 1.1455 | 1.4071 | 4.4296 | 5.000 | 3⅜ | 4⅓ ₃₂ | ⅓ | 0.426 | 5/32 | 5 |
| 5½ | 14 | 0.7241 | 1.2455 | 1.5071 | 5.4296 | 6.050 | 4⅛ | 5⅓ ₃₂ | ⅓ | 0.426 | 5/32 | 5 |
| 6 | 14 | 0.7741 | 1.2955 | 1.5571 | 5.9296 | 6.625 | 4⅓ | 6⅓ ₃₂ | ⅓ | 0.426 | 5/32 | 5 |
| 6½ | 11½ | 0.9123 | 1.3784 | 1.6973 | 6.5445 | 7.390 | 4⅔ | 6⅓ ₃₂ | ⅓ | 0.437 | 3/16 | 4 |
| 8½ | 11½ | 1.1123 | 1.5784 | 1.8973 | 8.5445 | 9.625 | 5⅓ | 6⅓ ₃₂ | ⅓ | 0.437 | 3/16 | 4 |

^A Taper of threads is 3/8 in./ft on diameter for all sizes.

TABLE 11 Drift Pin Dimensions

| NPS Designator | Length of Pin, in. | Diameter of Pin, in., Smaller Than Nominal Inside Diameter of Pipe |
|----------------|--------------------|--|
| To 6, incl | 12 | 3/32 |
| 8, 10, 12 | 12 | 1/8 |

12. Finish

12.1 The finished pipe shall be reasonably straight and free of defects. Any imperfection that exceeds 12½ % of the nominal wall thickness, or violates minimum wall shall be considered a defect.

12.2 The pipe ends shall be free of burrs. The zinc coating on galvanized pipe shall be free of voids or excessive roughness.

13. Galvanized Pipe

13.1 For the types of water well pipe required with galvanized coating, such coating shall comply with the requirements of the latest revision of Specification A 53/A 53M.

14. Number of Tests

14.1 One longitudinal or transverse tension test of seamless and welded pipe, and in addition, one transverse weld test for electric-welded pipe NPS 8 and larger, shall be made on one length of pipe from each lot of 500 lengths, or fraction thereof, of each size. A length is defined as the length as ordered, except that in the case of orders for lengths shorter than single random, the term lot shall apply to the lengths as rolled, prior to cutting to the required short lengths.

14.2 Each length of pipe shall be subjected to the hydrostatic test as indicated for the type, size, and grade as shown in Tables 4-9. The hydrostatic pressure shall be maintained for not less than 5 s for all sizes of seamless and electric-resistance-welded pipe.

15. Retests

15.1 If the results of the tension tests of any lot do not conform to the requirements of Table 1, the lot shall be

rejected, or retests shall be made on additional pipe of double the original number from the same lot, each of which shall conform to the requirements specified.

16. Test Methods

16.1 The tension tests required shall conform to those described in the latest issue of Test Methods and Definitions A 370.

16.1.1 The longitudinal tension test specimen shall be taken from the end of the pipe and for welded pipe the specimen may be taken from the skelp or strip, at a point approximately 90° from the weld and shall not be flattened between gage marks. The sides of each specimen shall be parallel between gage marks.

16.1.2 Transverse weld test specimen from electric-welded pipe shall be taken with the weld at the center of the specimen. All transverse test specimens shall be approximately 1½ in. or 38 mm wide in the gage length and shall represent the full wall thickness of the pipe from which the specimen was cut.

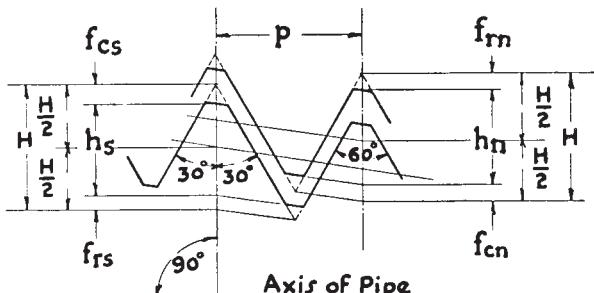
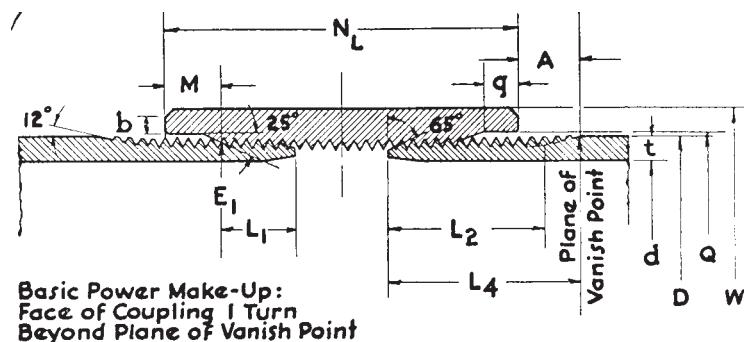
16.1.3 All specimens shall be tested at room temperature.

17. Hydrostatic Test

17.1 Each length of pipe shall be tested at the mill to the hydrostatic pressures as prescribed for each type of pipe in Table 3, Table 5, Table 7, and Table 9. The hydrostatic test may be applied at the discretion of the manufacturer on pipe with plain ends, with threads only, or with threads and coupling.

18. Inspection

18.1 The inspector representing the purchaser shall have entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests and inspection shall be made at the place of manufacture prior to shipment unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.



**Taper 1 in 64 on Diameter
(Shown Exaggerated in Diagram)**

Thread Height Dimensions, in.

| Thread Element | 8 Threads per Inch $p = 0.125$ |
|----------------------------|-----------------------------------|
| $H = 0.866p$ | 0.1082 |
| $h_s = h_n = 0.760p$ | 0.0950 |
| $f_{rs} = f_m = 0.033p$ | 0.0041 |
| $f_{cs} = f_{cn} = 0.073p$ | 0.0091 |

FIG. 1 Basic Threading Data for Drive Pipe (Handling-Tight Assembly) (See Table 4)

19. Rejection

19.1 Each length of pipe received from the manufacturer may be inspected by the purchaser and, if it does not meet the requirements of this specification based on the inspection and test method as outlined in the specification, the length may be rejected and the manufacturer shall be notified. Disposition of rejected pipe shall be a matter of agreement between the manufacturer and the purchaser.

19.2 Pipe found in fabrication or in installation to be unsuitable for the intended use, under the scope and requirements of this specification, may be set aside and the manufacturer notified. Such pipe shall be subject to mutual investigation as to the nature and severity of the deficiency and the forming or installation, or both, conditions involved. Disposition shall be a matter for agreement.

20. Certification

20.1 The producer or supplier shall, upon request, furnish to the purchaser a certification of inspection stating that the material has been manufactured, sampled, tested, and inspected in accordance with this specification (including the year date designation) and has been found to meet the requirements.

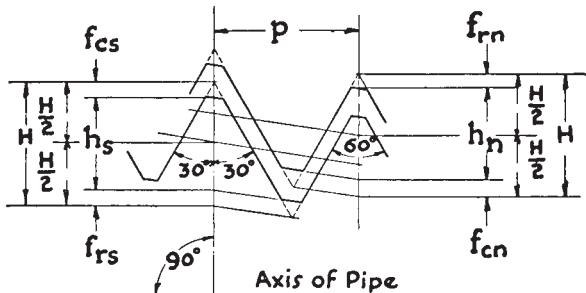
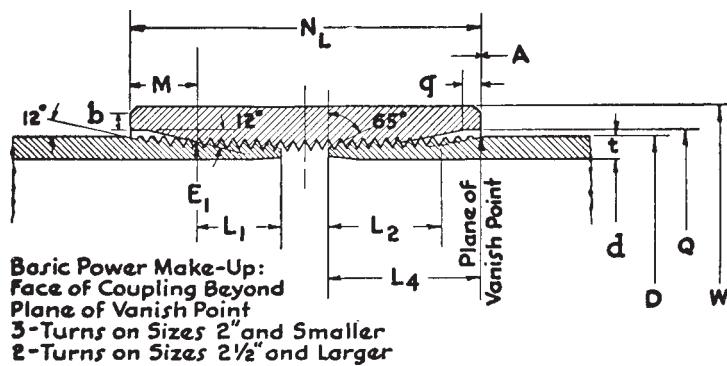
21. Product Marking

21.1 Each length of pipe shall be legibly marked by rolling, stamping, or stenciling to show: the name or brand of the manufacturer, type number, the kind of pipe (butt-welded, electric-resistance-welded, or seamless), grade, nominal or outside diameter size, wall thickness, the specification number and the length. Length shall be marked in feet and tenths of a foot or metres to two decimal places, depending on the units to which the material was ordered or other marking subject to agreement.

21.2 Marking shall begin approximately 12 in. (305 mm) from the coupling of each length.

21.3 Type II pipe NPS 1 1/2 and under and for all sizes of Type III pipe, the required marking as specified in 21.1 may be applied to a tag securely attached to the bundle or bale prepared for shipment.

NOTE 2—When pipe sections are cut into shorter lengths by a subsequent processor for resale as material, the processor shall transfer complete identifying information to each unmarked cut length, or to metal tags securely attached to bundles of unmarked small diameter pipe. The same material designation shall be included with the information transferred, and the processor's name, trademark, or brand shall be added.



Taper 1 in 16 on Diameter
(Shown Exaggerated in Diagram)

Thread Height Dimensions, in.

| Thread Element | 1 1/2 Threads per Inch $p = 0.0870$ | 8 Threads per Inch $p = 0.125$ |
|----------------------------|--|-----------------------------------|
| $H = 0.866p$ | 0.0753 | 0.1082 |
| $h_s = h_n = 0.760p$ | 0.0661 | 0.0950 |
| $f_{rs} = f_{rn} = 0.033p$ | 0.0029 | 0.0041 |
| $f_{cs} = f_{cn} = 0.073p$ | 0.0063 | 0.0091 |

FIG. 2 Basic Threading Data for Water-Well Reamed and Drifted Pipe (Handling-Tight Assembly) (See Table 6)

21.4 Bar Coding—In addition to the requirements in 21.1, 21.2, and 21.3, bar coding is acceptable as a supplemental identification method. The purchaser may specify in the order a specific bar coding system to be used.

22. Packaging

22.1 All types and sizes of water well pipe may be shipped loose except that NPS 1½ and smaller sizes of Type II pipe and all sizes of Type III pipe shall be packaged in bundles or bales of convenient size for handling.

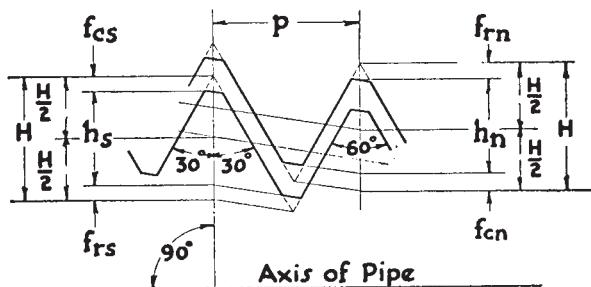
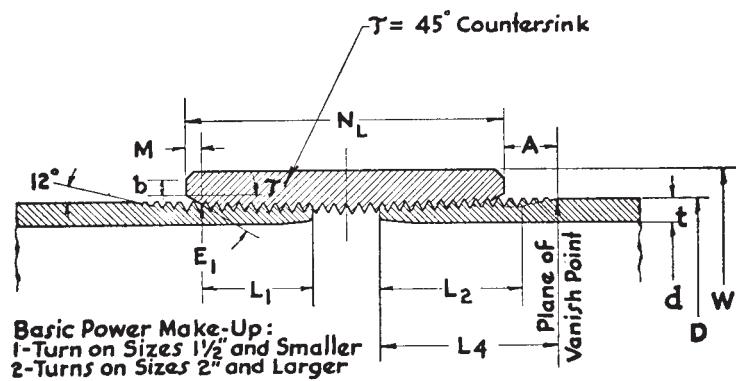
22.2 If special packaging is required for any pipe size, such requirements shall be negotiated and the required practice shall be indicated on the purchase order.

23. Keywords

23.1 carbon steel pipe; seamless steel pipe; steel pipe; water well pipe; welded steel pipe



A 589 – 96 (2001)



Taper 1 in 16 on Diameter
(Shown Exaggerated in Diagram)

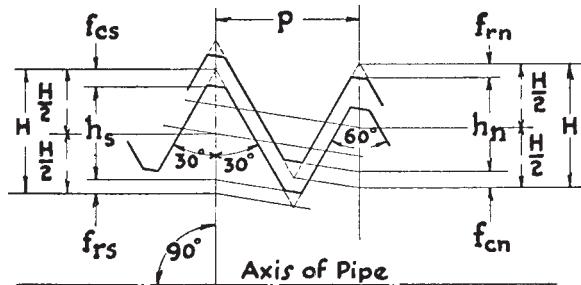
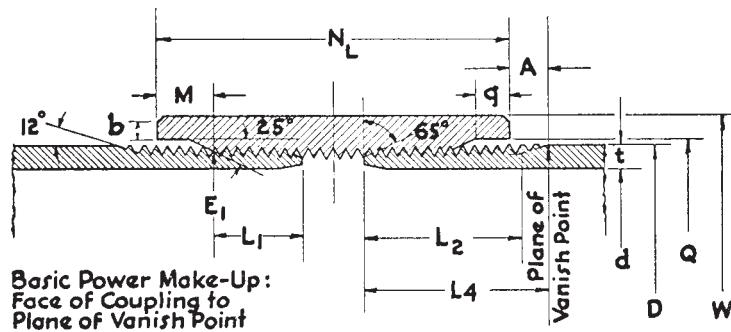
Thread Height Dimensions, in.

| | |
|----------------------------|---|
| Thread Element | 1 1/2 Threads per Inch $p = 0.0870$ |
| $H = 0.866p$ | 0.0753 |
| $h_s = h_n = 0.760p$ | 0.0661 |
| $f_{rs} = f_{rn} = 0.033p$ | 0.0029 |
| $f_{cs} = f_{cn} = 0.073p$ | 0.0063 |

FIG. 3 Basic Threading Data for Driven Well Pipe (Handling-Tight Assembly) (See Table 8)



A 589 – 96 (2001)



Taper 1 in 32 on Diameter
(Shown Exaggerated in Diagram)

Thread Height Dimensions, in.

| Thread Element | 14 Threads per Inch p = 0.0714 | 11½Threads per Inch p = 0.0870 |
|----------------------------|--------------------------------------|--------------------------------------|
| H = 0.866p | 0.0619 | 0.0753 |
| $h_s = h_n = 0.760p$ | 0.0543 | 0.0661 |
| $f_{rs} = f_{rn} = 0.033p$ | 0.0024 | 0.0029 |
| $f_{cs} = f_{cn} = 0.073p$ | 0.0052 | 0.0063 |

FIG. 4 Basic Threading Data for Water-Well Casing (Handling-Tight Assembly) (See Table 10)



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